REMARKS

This is in response to the Office Action dated September 10, 2003. New claims 142-144 have been added. Thus, claims 29-144 are now pending.

Claim 29

Claim 29 stands rejected under 35 U.S.C. Section 102(b) as being allegedly anticipated by Adomi. This Section 102(b) rejection is respectfully traversed for at least the following reasons.

Claim 29 as amended requires "supplying aluminum and ammonium (NH_3) ***directly onto a surface of the crystal***, wherein addition or crystallization of the nitrogen from the ammonium which is supplied directly onto the surface of the crystal into the surface of the crystal is accelerated by the aluminum supplied directly onto the surface of the crystal." In other words, claim 29 requires supplying aluminum and ammonium directly onto the surface of a crystal. This surprisingly results in a phenomenon of accelerating the surface absorption and accelerating the surface dissolution of ammonium by way of aluminum at the surface. This is applicable, for example, to a method of growing a crystal, such as MBE or GB-MBE method, without necessarily needing a gaseous reaction between the ammonium and aluminum.

In contrast, Adomi fails to disclose or suggest supplying aluminum and ammonium directly onto the surface of a crystal. Adomi grows a crystal of AlGaPN via a MO CVD method. TMAI is an Al source, ammonium a N source; so that as explained by Adomi when the Al is mix-crystallized N concentration in the crystal is increased.

Adomi explains that when ammonium is used as an N source, an adduct (TMAI:ammonium) is formed between the ammonium and TMAI and the chemical bonding between Al and N plays a role when N is doped in AlGaP. Importantly, since MO-CVD and CBE methods are used in Adomi to grow a crystal of AlGaPN, the reference uses an intermediate product produced by reaction within gaseous phase between ammonium and an organic compound of Al *without employing the surface of the substrate*. Thus, it can be seen that Adomi fails to disclose or suggest supplying aluminum and ammonium directly onto the surface of a crystal as required by claim 29. The claim cannot be anticipated. Adomi is entirely unrelated to the invention of claim 29 in this respect.

Other Claims

With respect to claims 63 and 100, the cited art also fails to disclose or suggest supplying aluminum and ammonium directly onto the surface of a crystal.

Claims 34, 68 and 105 require using either molecular beam epitaxial (MBE) growth or a gas source molecular beam epitaxial (GS-MBE) growth method. Adomi fails to disclose or suggest this aspect of these claims. The Office Action admits that Adomi uses a chemical beam epitaxy (CBE) method. In contrast, claims 34, 68 and 105 are limited to one of MBE and GS-MBE, which is not disclosed or suggested by Adomi.

Claims 142-144 require a temperature range of from 450-680 degrees C. Temperature is an important aspect of methods according to certain embodiments of this invention. For example, it has been found that by using Al and nitrogen together in a

deposition process involving Molecular Beam Epitaxy (MBE), it is possible to crystallize nitrogen into a mixed crystal in an efficient manner at temperatures of 450 degrees C or more. However, using such a technique, it has surprisingly been found that substrate temperatures of higher than 680 degrees C are problematic because a nitride phase of AlGaN or the like, which is readily generated at high temperature(s), is mixed and causes phase separation (e.g., pg. 37, lines 1-14; and Fig. 4). Thus, it has surprisingly been found that the appropriate temperature range for the use of Al and nitrogen in MBE is 450-680 degrees C.

With respect to claims 142-144, we note that Adomi uses an undesirably high temperature of 850 degrees C (col. 3, lines 21-22). The instant specification teaches that this is much too high and results in undesirable phase separation (e.g., pg. 37, lines 1-14). Moreover, one of ordinary skill in the art would not have used Tomomura's temperature in the technique of Adomi because there are different layer forming techniques involved in the two references (i.e., MOVPE in Adomi, and MBE in Tomomura). In other words, one of ordinary skill in the art would not have used the MBE temperature (580 degrees C) of Tomomura in the MOVPE system of Adomi because the deposition techniques in the two references are entirely unrelated to one another. Furthermore, there is no suggestion in the art for using a temperature of 450-680 degrees C when forming a crystal layer using a combination of nitrogen and aluminum and required by these claims; and this claimed temperature range provides for unexpected results (e.g., pg. 37, lines 1-13).

Conclusion

For at least the foregoing reasons, it is respectfully requested that all rejections be withdrawn. All claims are in condition for allowance. If any minor matter remains to be resolved, the Examiner is invited to telephone the undersigned with regard to the same.

Respectfully submitted,

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